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REPORT ON BLOWER USED IN TESTS OF AIR-COOLED CYLINDERS

(POWER PLANT SECTION REPORT)

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REPORT ON BLOWER USED IN TESTS OF AIR-COOLED CYLINDERS.

OBJECT OF TEST.

The purpose of the investigation was to determine the mean air velocities at the discharge of the blower used for cooling air-cooled cylinders on test and to study the effect on these velocities of varying the size of opening at the intake of the blower.

RESULTS.

The curves in Figure 1 show roughly the relation between orifice diameter and mean air velocity. It will be noted that the mean air velocity change with orifice diameter is almost a straight line variation, with the outside inlet alone open. With the larger orifice sizes the addition of the inside inlet opening adds noticeably to the blast velocity.

DESCRIPTION.

The blast for cooling air-cooled cylinders on the test stand (Engineering Division, McCook Field) is furnished by a 20-inch outlet Sirocco blower, manufactured by the American Fan and Blower Co. of Detroit, Mich. The blower is driven by a 100-horsepower induction motor and is fitted with a movable duct, directing the blast to the cylinder. An intake pipe from the roof is provided which permits the use of inside and outside air or outside air alone for cooling. Removal of one side of the intake "box" shown in Figure 4 admits air from the room to the blower. The cooling air velocity is regulated by orifice boards at the blower intake, adjusting the air flow by varying the size of the entrance orifice. Figures 3, 4, and 5 show the blower and driving motor.

METHOD OF TEST.

Air speed determinations were made with a combined Pitot and straight tube air speed indicator which had been calibrated previously with known air velocities in a wind tunnel. Readings were taken at points distributed over the mouth of the outlet duct as shown in the diagram, Figure 2.

With orifice plates of various diameter orifices inserted separately, runs were made for two determinations of mean velocity for each orifice, one with both inside and outside intakes open and one with the outside intake alone opened.

Because of their wide variance from the readings at the center of the duct and the slight effect on the cylinder cooling of the blast at these points, the outer readings, Nos. 1, 2, 3, 5, 6, and 7 have been disregarded in computing the mean air velocities. The others have been given equal weight in obtaining the average velocity.

RESULTS.

The curves in Figure 1 show the results of the average air velocity determinations, both with and without inside air admission to the blower. Data are tabulated in Tables 1 and 2. Because of the wide fluctuations of the air velocities in the duct, the readings, at best, are little better than approximations. The curves, however, show roughly the relation between orifice diameter and air speed and furnish a basis for estimating sizes of orifices to furnish any desired cooling air velocity. In general there seems to be very nearly a straight line relation between mean air velocity variation and the variation of orifice diameter, when the outside air inlet only is opened. With both inlets open, the straight line variation appears to hold true only with large orifice diameters. As the orifices grow smaller, however, the orifice resistance is sufficient to annul the influence of the change in intake area and the two curves converge. The highest point on the curves, 28-inch diameter, represents full open blower inlet and hence the highest possible blast velocity.

TABLE 1.—*Air speed (miles per hour).*

OUTSIDE INTAKE ONLY OPEN.

Station No.	28-inch orifice.	22-inch orifice.	21-inch orifice.	20-inch orifice.	17½-inch orifice.	17½-inch orifice.	14½-inch orifice.	12-inch orifice.
1	83.5	60.0	57.2	55.0	49.0	49.0	38.0	30.8
2	105.0	72.5	73.5	70.5	39.5	63.1	49.0	34.2
3	98.0	66.5	65.2	65.2	57.2	57.2	45.5	32.8
4	107.7	81.0	79.1	78.1	63.1	66.6	53.2	36.8
5	102.2	82.0	78.2	79.2	60.0	58.6	49.0	33.8
6	98.0	76.5	74.5	67.5	55.0	53.2	41.0	29.0
7	86.0	66.5	64.2	64.2	47.8	47.8	42.8	29.0
8	94.0	64.2	63.2	63.2	52.0	53.2	39.5	33.5
9	105.0	70.5	66.7	64.2	56.0	56.0	45.2	33.5
10	111.5	78.2	74.5	69.5	61.0	62.0	47.0	32.8
11	118.0	81.0	81.0	80.0	65.2	66.6	52.0	35.0
12	110.2	86.0	83.5	77.2	61.0	60.0	46.0	34.2
13	98.0	83.5	84.5	79.2	60.0	57.2	47.0	33.5
14	101.0	80.0	75.2	67.5	52.0	55.0	42.2	29.0
15	96.6	73.5	70.5	67.5	53.2	53.2	42.8	31.5
16	101.0	75.5	66.7	65.2	55.0	56.0	42.0	30.0
17	107.7	86.0	76.5	70.5	56.0	56.0	42.0	29.0

July 26–27, 1921.

TABLE 2.—*Air speed (miles per hour).*

OUTSIDE AND INSIDE INTAKES OPEN.

Station No.	28-inch orifice.	22-inch orifice.	20-inch orifice.	17½-inch orifice.
1	94.5	82.8	66.5	46.0
2	135.0	92.3	86.0	64.5
3	119.0	84.5	74.5	60.0
4	122.8	95.2	86.0	69.5
5	110.5	93.8	81.0	70.5
6	132.1	93.0	78.2	63.2
7	116.8	84.5	67.5	57.2
8	109.7	92.3	74.5	52.0
9	123.0	96.6	79.2	60.0
10	125.6	102.2	90.0	68.5
11	140.0	103.5	92.2	73.5
12	125.0	106.5	89.1	71.5
13	127.0	99.5	82.8	73.5
14	127.8	99.5	85.2	67.5
15	130.0	99.5	81.0	63.2
16	118.6	102.2	82.0	62.0
17	127.8	107.0	91.5	65.2

July 26–27, 1921.

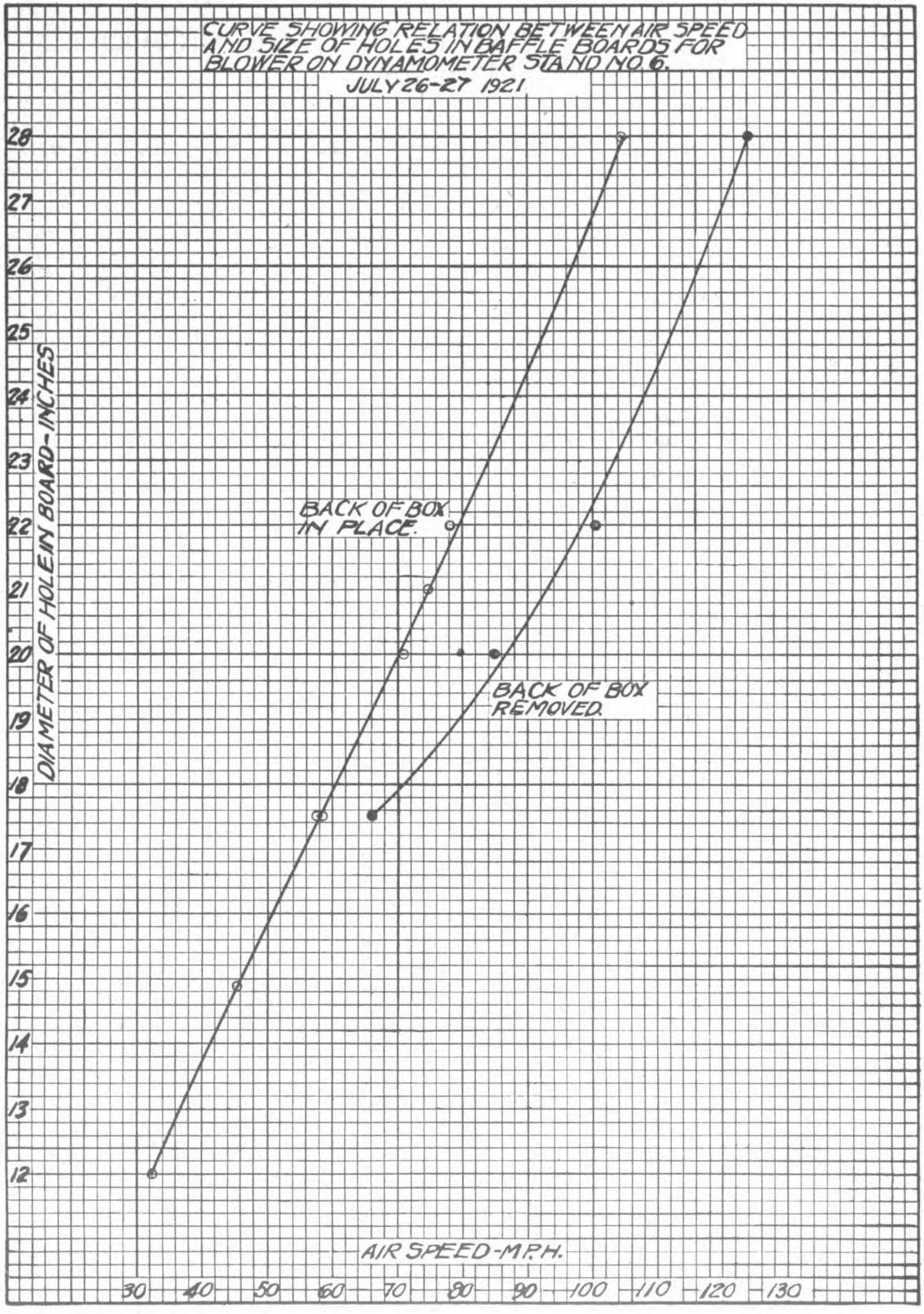

FIGURE 1.

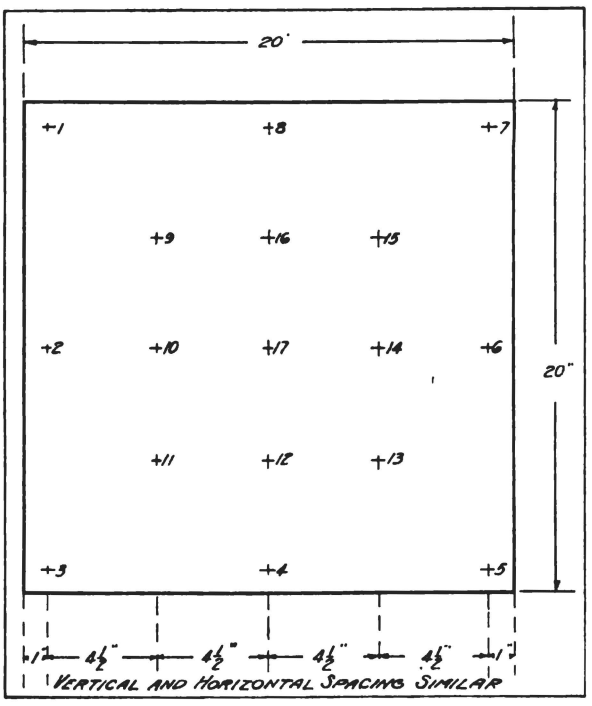

FIG. 2.—Location of air blast velocity readings in blower duct (facing blower outlet).

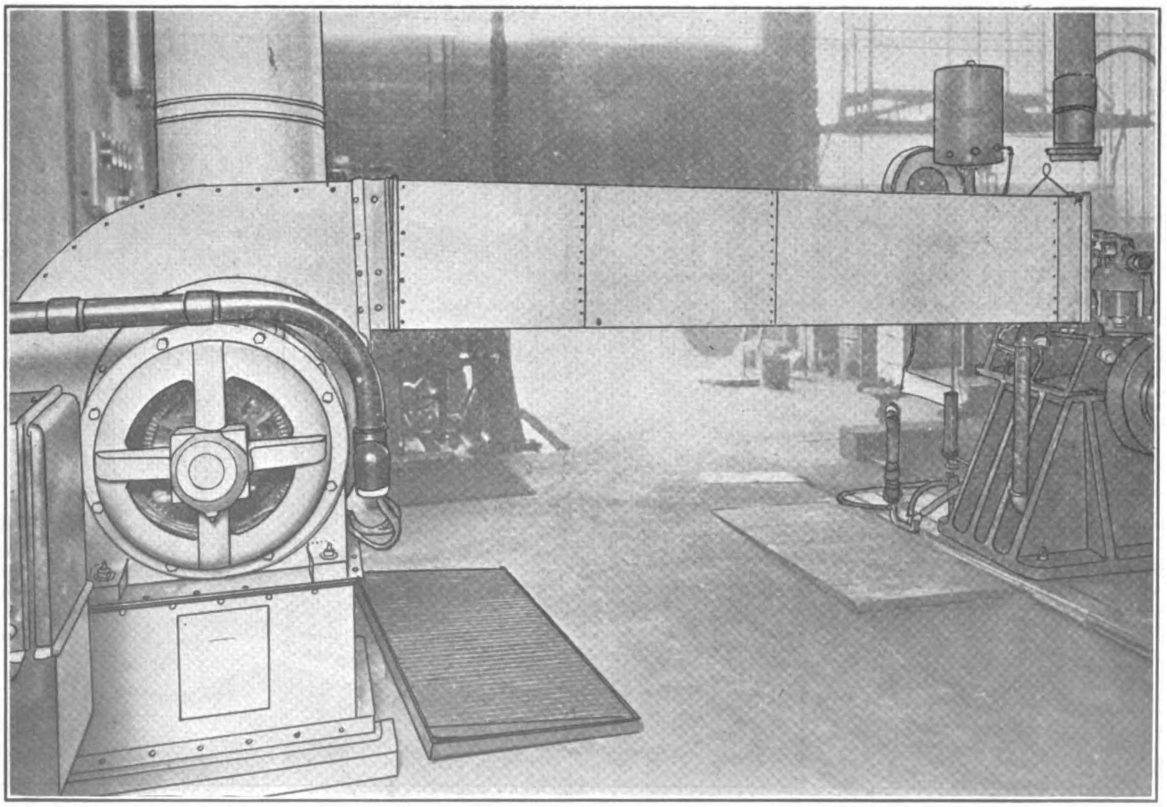

FIG. 3.—Blower, driving motor, and air duct.

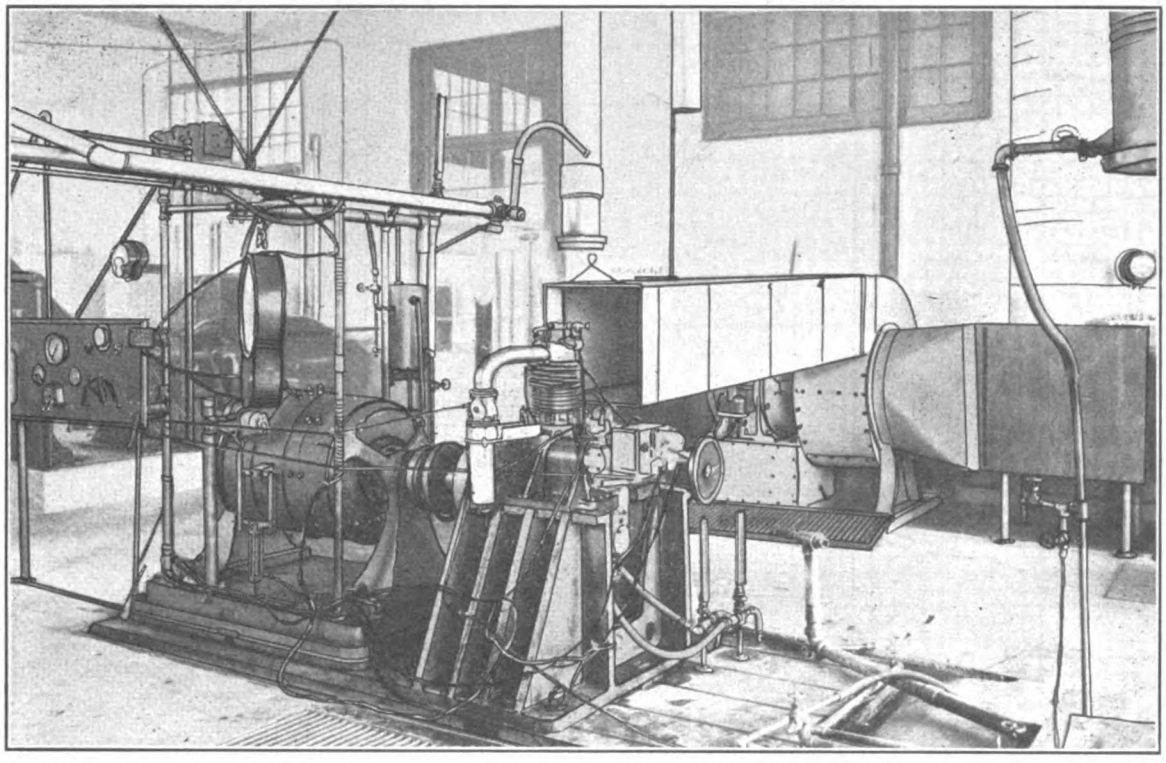

FIG. 4.—Air-cooled cylinder test stand, showing blower and air duct.

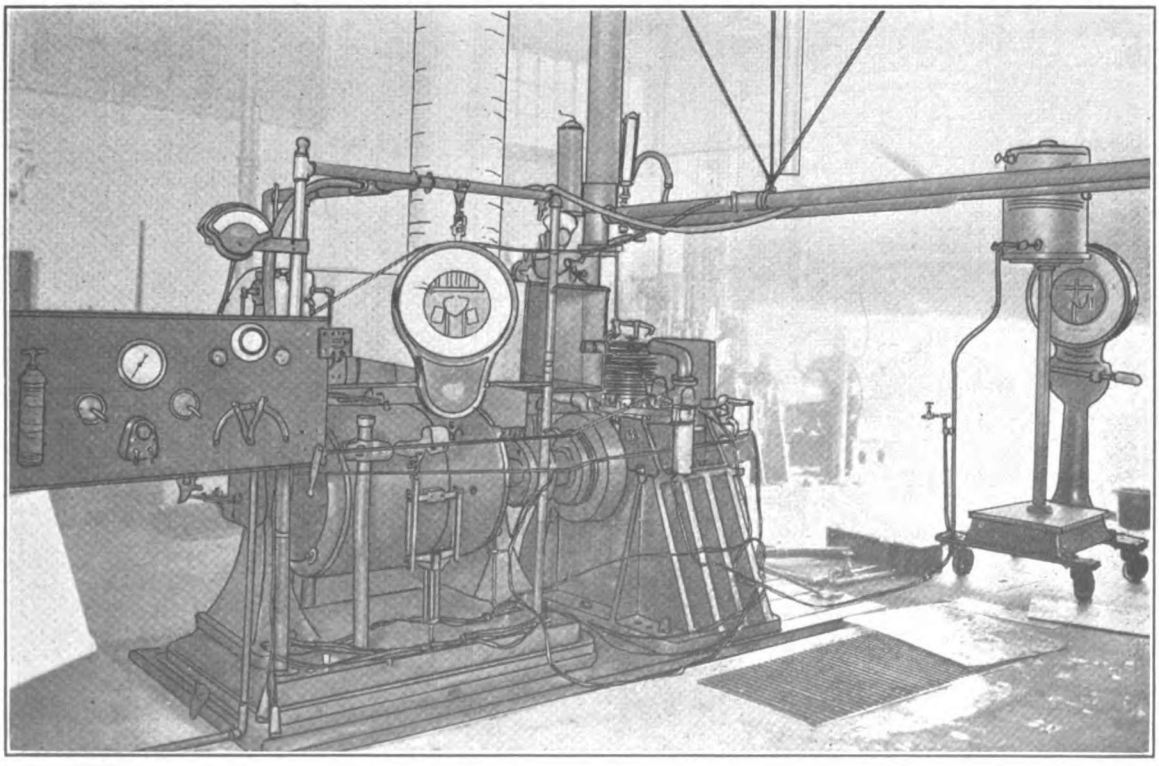

FIG. 5.—Air-cooled cylinder test stand.